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Complete Summary

GUIDELINE TITLE

Renal cell carcinoma staging.

BIBLIOGRAPHIC SOURCE(S)

Choyke PL, Bluth EI, Bush WH Jr, Casalino DD, Francis IR, Jafri SZ, Kawashima A, Kronthal A, Older RA, Papanicolaou N, Ramchandani P, Rosenfield AT, Sandler CM, Segal AJ, Tempany C, Resnick MI, Expert Panel on Urologic Imaging. Renal cell carcinoma staging. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 5 p. [40 references]

GUIDELINE STATUS

This is the current release of the guideline.

It updates a previous published version: American College of Radiology, Expert Panel on Urologic Imaging. Renal cell carcinoma staging. Reston (VA): American College of Radiology (ACR); 2001. 5 p. (ACR appropriateness criteria). [33 references]

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Renal cell carcinoma

GUIDELINE CATEGORY

Diagnosis
Evaluation
Screening

CLINICAL SPECIALTY

Family Practice
Internal Medicine
Nephrology
Oncology
Radiation Oncology
Radiology
Urology

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of radiologic examinations in the staging of renal cell carcinoma

TARGET POPULATION

Adult patients with renal cell carcinoma

INTERVENTIONS AND PRACTICES CONSIDERED

1. X-ray
    - Chest
    - Kidney, excretory urography, intravenous pyelogram (IVP)
    - Kidney, intravenous urography, IVP
    - Bone survey
2. Computed tomography angiography (CTA), abdomen
3. Magnetic resonance angiography (MRA), abdomen
4. Computed tomography (CT), chest
5. Ultrasound (US), abdomen
6. Invasive
    - Kidney, angiography
    - Vena cava, venacavography inferior
7. Nuclear medicine (NUC), bone scan
8. Magnetic resonance imaging (MRI), brain
9. Fluorodeoxyglucose positron emission tomography (FDG PET), kidney

MAJOR OUTCOMES CONSIDERED

Utility of radiologic examinations in differential diagnosis

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of peer-reviewed medical journals, and the major applicable articles were identified and collected.

NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed for reaching agreement in the formulation of the appropriateness criteria. The American College of Radiology (ACR) Appropriateness Criteria panels use a modified Delphi technique to arrive at consensus. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1-9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty percent agreement is considered a consensus. This modified Delphi technique enables individual, unbiased expression, is economical, easy to understand, and relatively simple to conduct.

If consensus cannot be reached by the Delphi technique, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible. If "No consensus" appears in the rating column, reasons for this decision are added to the comment sections.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria®

Clinical Condition: Renal Cell Carcinoma Staging (Renal Mass Previously Identified)

Variant 1: Tumor ≤3 cm.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	8	
CTA, abdomen	8	
MRA, abdomen	8	
CT, chest, multidectector	5	
US, abdomen	4	
Invasive, kidney, angiography	2	
INV, vena cava, venacavography inferior	2	
NUC, bone scan	2	
X-ray kidney, excretory urography, IVP	2	
MRI, brain	2	
X-ray, bone survey	2	
FDG PET, kidney	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Tumor >3 cm.

Radiologic Exam Procedure	Appropriateness Rating	Comments
CTA, abdomen	9	
X-ray, chest	8	
CT, chest	8	
MRA, abdomen	8	
FDG PET, kidney	4	

Radiologic Exam Procedure	Appropriateness Rating	Comments
US, abdomen	3	
INV, vena cava, venacavography inferior	3	
NUC, bone scan	3	
MRI, brain	3	
INV, kidney, angiography	2	
X-ray kidney, intravenous urography, IVP	2	
X-ray, bone survey	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Renal cell carcinoma (RCC) represents about 2-3% of all human malignancies. There are approximately 30,000 new cases of renal cancer diagnosed per year, resulting in approximately 12,000 deaths. Men are more commonly affected than women in a 2:1 to 3:1 ratio. Metastatic disease at presentation varies with the patient population but typically occurs in 23-33%. The most common sites of distant metastases in descending order are the lung, bone, skin, liver, and brain.

The traditional treatment for RCC is radical nephrectomy, which involves node dissection and complete removal of the kidney and Gerota's fascia. Nephron sparing surgery is increasingly used for small tumors. Prognosis is related to tumor size and stage. There are two staging systems in common use in the United States. Robson's classification is more commonly used in the United States, while the tumor node metastases (TNM) classification is more commonly employed internationally. See the original guideline document for a comparison of the two classifications.

Approximately 33% of cases present in Stage I, 10% in Stage II, 25% in Stage III, and 33% in Stage IV. Median 5-year survival rates are 73% for Stage I, 68% for Stage II, 51% for Stage III, and 20% for Stage IV.

Prognosis is related to the size of the primary tumor as well. In one large study, T1 (<2.5 cm) tumors produced a 100% 5-year survival, whereas tumors >10 cm in diameter yielded a median survival of 27% at 5 years.

Only 5-10% of patients present with the classic triad of flank mass, hematuria, and pain. Since the widespread use of US, CT, and MRI, RCCs are increasingly discovered when they are small and therefore at lower stage. These incidentally discovered tumors have a much better prognosis than symptomatic tumors.

Preoperative staging is important to the surgeon in planning the procedure. Tumor size is accurately determined by CT, MRI, and US. Perinephric tumor extension (T3a) is often more difficult due to nonspecific perinephric stranding. High resolution CT using thin sections (~1mm) can demonstrate perinephric stranding with high sensitivity (>95%), although false positives can be problematic. High resolution spiral CT has proven more accurate than MRI for detecting perinephric disease; however, this determination is often not critical since the tumor and perinephric fat are usually removed at the time of surgery. An argument has been made that the diagnosis of T3a disease should be excluded prior to nephron-sparing surgery.

Identification of tumor thrombus (T3b or T3c) disease is vital for accurate staging. Not only must the involvement of the renal veins and inferior vena cava (IVC) (T3b or T3c) be identified, but the cephalic extent of the tumor must also be correctly assessed. Intra-atrial thrombus may require cardiac bypass. Intrahepatic caval thrombus may require open thrombectomy or graft placement. Thrombus limited to the renal vein ostia may be "milked" back into the vein without the need to open the vein. Therefore, accurate assessment of caval thrombus is important.

Dynamic enhanced CT is the most commonly employed method of identifying caval thrombus. Studies have shown that the technique used influences the success of CT, particularly with regard to the speed of scanning and rate of contrast media administration. Signs suggestive of renal vein or caval thrombus include filling defects, enlargement of the vessel, and rim enhancement. Venous anomalies should be sought, specifically in the retroaortic left renal vein or the circumaortic left renal vein. Computed tomography is 50-100% sensitive for detecting caval thrombus according to the literature, but with good technique achieves 85-91% sensitivity routinely. Problems occur with technically inadequate boluses of contrast media, motion and flow artifact (especially with foot injections), and renal insufficiency.

MRI is 83-100% sensitive for tumor thrombus but routinely achieves 90-100% sensitivity for tumor thrombus with modern equipment and thus is slightly more sensitive than CT and more accurately assesses the cephalic extent of the thrombus. Pitfalls of MRI include large tumors compressing the vena cava and flow-related artifacts, which can be reduced with appropriate saturation pulses. With bright blood techniques, rapid or turbulent flow can also lead to artifacts. Intravenous contrast may be helpful in this setting.

Most authors consider MRI superior to CT for detecting tumor thrombus. However, if the CT is of good quality obtained at several phases after contrast administration and the vein is clearly seen, MRI is usually not needed. Other techniques include US, which is approximately 50%-75% sensitive for caval thrombus and can be helpful for quickly identifying the cephalad extent of a tumor thrombus.

US is limited in obese patients and due to the presence of bowel gas, which interferes with the ability to image the renal vein-IVC junction.

Cavography is approximately 85-100% sensitive for detecting caval thrombus and is equal to MRI in accuracy. However, multidetector, multiphasic CT or MRI suffices to diagnose caval thrombus, and thus catheter cavography is rarely needed. Angiography has proved insensitive for tumor thrombus.

For TxN+ disease (lymph node involvement), CT and MRI are approximately equal, and both are superior to US. US is often obscured by bowel gas. However, from a surgical perspective, the identification of nodes is less important because the nodes must be sampled at the time of surgery. CT-guided aspiration biopsies can be performed if desired for documenting nodal metastases; however; they are rarely needed. Imaging is important for the preoperative detection of bulky adenopathy, which might complicate the surgical approach. This is especially true for laparoscopic nephrectomies in which both the vascular anatomy and the nodal pathology may be poorly visualized. Accurate preoperative information becomes even more important, emphasizing the need for CTA or MRA prior to such a procedure.

T4 M0-1 disease (metastatic disease with contiguous invasion) is also important to the surgeon. Common sites of contiguous organ invasion include the liver, diaphragm, psoas muscles, pancreas, and bowel. Neither CT nor MRI is ideal, because it is impossible at times to distinguish immediately adjacent but not invasive tumor from directly invasive tumor; however, both techniques perform well, with a sensitivity and specificity >90%. The multiplanar capabilities of MRI can be useful in this regard; however, neither technique always assesses liver or diaphragmatic invasion correctly. Angiography can also be misleading, since tumors can recruit vessels from the liver or elsewhere without the tumor actually invading the organ.

T4 M1 N+ disease (distant metastases) principally affects the chest, bone, liver, and brain. Routine chest radiographs are considered necessary, but the routine use of chest CT is more controversial. For small lesions (<3 cm) the risk of metastases is so small as to eliminate the need for CT; however, the risk increases with the size of the primary tumor, and universally accepted guidelines do not yet exist. For larger tumors, chest CT is justified. When the chest radiograph is suspicious or positive, chest CT is useful for confirming or excluding metastases and defining the extent of disease.

Similarly, neither routine bone scans nor bone surveys appear routinely justified. However, if the patient has an elevated alkaline phosphatase, bone pain, or an extremely large and aggressive tumor, bone scans may be helpful. Furthermore, brain MRI does not appear routinely justified but is indicated when neurologic symptoms are present, if the primary tumor is large, or if other metastatic disease is already present.

Positron emission tomography (PET) does not yet have an established role in staging renal cancer. Early studies using FDG-PET suggest that it may be difficult to even detect primary renal cancers against the normal background of high activity in the kidneys. PET may be helpful for establishing metastatic disease in lesions detected by CT or MRI and may be used to detect unsuspected metastases in high risk patients. To date, FDG-PET has mainly been used in evaluating recurrent disease prior to curative resection.

Thus, the routine staging of renal cancer should depend on the size of the primary tumor. For small or incidentally detected tumors ($\leq$3cm), multidetector, multiphasic CT of the abdomen with either CT of the chest or chest radiography is usually sufficient. MRI of the abdomen is a suitable substitute when the patient cannot undergo contrast-enhanced CT. If symptoms of bone pain or neurologic symptoms exist, bone scan or MRI of the brain may be employed.

For larger primary tumors (>3 cm), multidetector, multiphasic CT of the abdomen with chest CT is the diagnostic modality of choice. If the status of the renal veins and inferior vena cava cannot be resolved on CT, a contrast-enhanced multiphasic 3D MRI of the inferior vena cava should be performed. MRI of the abdomen is a suitable substitute for staging renal cancer when the patient cannot undergo contrast-enhanced CT. US may be performed prior to surgery to ascertain the cephalad extent of a previously identified caval tumor thrombus but cannot be relied upon to detect small renal vein or IVC thrombus. Cavography is employed only in unusual circumstances. Prior to any major surgery to remove a locally advanced primary tumor, brain MRI and bone scan should be performed. Lesions detected by any modality that are suspicious for metastatic disease should either be biopsied or a FDG-PET scan should be performed.

Although not strictly staging, CTA and MRA should be incorporated into any staging study of the renal cancer, as the vascular information can be helpful to surgeons in planning a resection. Catheter angiography can be performed to embolize large tumors prior to resection.

Anticipated Exceptions

In patients with history of adverse reaction to contrast media or renal insufficiency, MRI and/or US may be preferred to CT. MRI is superior to US in evaluating adenopathy, determining the organ of origin of the mass, diagnosing intracaval and renal venous thrombus, and demonstrating bone metastases.

Abbreviations

- CT, computed tomography
- CTA, computed tomography angiography
- FDG PET, fluorodeoxyglucose positron emission tomography
- INV, invasive
- IVP, intravenous pyelogram
- MRA, magnetic resonance angiography
- MRI, magnetic resonance imaging
- NUC, nuclear medicine
- US, ultrasound

CLINICAL ALGORITHM(S)

Algorithms were not developed from criteria guidelines.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Selection of appropriate radiologic imaging procedures for renal cell carcinoma staging

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Personal Digital Assistant (PDA) Downloads

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Choyke PL, Bluth EI, Bush WH Jr, Casalino DD, Francis IR, Jafri SZ, Kawashima A, Kronthal A, Older RA, Papanicolaou N, Ramchandani P, Rosenfield AT, Sandler CM, Segal AJ, Tempany C, Resnick MI, Expert Panel on Urologic Imaging. Renal cell carcinoma staging. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 5 p. [40 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1995 (revised 2005)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

GUIDELINE COMMITTEE

Committee on Appropriateness Criteria, Expert Panel on Urologic Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

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GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

ACR Appropriateness Criteria® Anytime, Anywhere™ (PDA application). Available from the ACR Web site.

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- ACR Appropriateness Criteria®. Background and development. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on May 6, 2001. The information was verified by the guideline developer on June 29, 2001. This summary was updated by ECRI on September 8, 2004. The updated information was verified by the guideline developer on October 8, 2004. This NGC summary was updated by ECRI on February 9, 2006.

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Date Modified: 9/25/2006